IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	: Zvi Yaniv	Art Unit	: 1762
Serial No.	: 10/633,335	Examiner	: Elena Tsoy
Filed	: August 1, 2003	Conf. No.	: 4189
Title	: REMOTE IDENTIFICATION OF EXPLOSIVES AND OTHER HARMFUL MATERIALS		

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Commissioner for Patents
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APPEAL BRIEF

This Appeal Brief is submitted pursuant to the Notice of Appeal filed in the U.S. Patent and Trademark Office on December 11, 2006, and in support of the appeal from the Final Rejection set forth in the Office Action mailed on September 11, 2006. The fee for filing a brief in support of an appeal is enclosed herewith. Furthermore, pursuant to 37 CFR §1.136, applicant hereby petitions that the period for response to the action dated December 11, 2006, be extended for one month to and including March 11, 2007, by the enclosed Petition for Extension of Time.

I. REAL PARTY-IN-INTEREST

The real party in interest is Nano-Proprietary, Inc., which is the assignee of the entire right and interest in the present Application.

II. RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences known to Appellants, the Appellants' legal representative, or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-15 and 21-30 are pending in the Application.

Claims 1-15 and 21-30 stand rejected.

Claims 16-20 were previously cancelled.

IV. STATUS OF AMENDMENTS

There were no amendments to the claims or Specification filed after the Final Rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Both independent claims 1 and 21 recite the step of exposing a chemical species to nanoparticles such that the chemical species physisorbs onto a surface of an adsorbate wherein such exposing is carried out as an exposure selected from the group consisting of a gas phase exposure, a solid phase exposure, and combinations thereof. The steps in the claims are shown in Figure 1. The exposing step is described in the Specification on page 6, line 20- page 7, line 7. The next step in the process is irradiating the nanoparticles comprising the absorbate with radiation. This is described as step 102 on page 7, lines 7-9. The claims then recite detecting altered photoluminescent properties of the nanoparticles comprising the absorbate. This is described in the Specification on page 7, lines 10-16. The claims then recite analyzing the altered photoluminescent properties. This is described in the Specification on page 7, lines 16-22. Claim 21 recites that the nanoparticles may be quantum-confined silicon nanoparticles. This is disclosed in the Specification on page 4, lines 2-22 and page 10, lines 1-18.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Claims 1, 3, 5, 8, 15 stand rejected under 35 U.S.C. §102(e) as being anticipated by *Dimitrov* (U.S. Published Patent Application No. 2003/0013091).

2. Claims 1-5, 8, 10, 11, 14, 21, 22, 25, 26 and 30 have been rejected under 35 U.S.C. §103(a) as being unpatentable over *Weiss et al.*, United States Patent No. 5,990,479 ("*Weiss*") in view of *Dimitrov* or *Vossmeyer*, United States Patent No. 6,458,327 ("*Vossmeyer*").

3. Claims 1-5, 8, 12, 15, 21, 22, 27, 29 and 30 have been rejected under 35 U.S.C. §103(a) as being unpatentable over *Daniels et al.*, United States Patent Application Publication No. 20020004246 ("*Daniels*") in view of *Dimitrov* or *Vossmeyer*.

4. Claims 1-3, 5, 6, 8, 10, 11 and 14 have been rejected under 35 U.S.C. §103(a) as being unpatentable over *Chee et al.*, United States Patent No. 6,544,732 ("*Chee*") in view of *Dimitrov* or *Vossmeyer*.

5. Claims 1-3, 5, 6, 8, 10, 11, 14 have been rejected under 35 U.S.C. §103(a) as being unpatentable over *Barbera-Guillem et al.*, United States Patent No. 6,261,779 ("*Barbera-Guillem*") in view of *Dimitrov* or *Vossmeyer*.

6. Claims 2, 21, 25, 26, and 29 have been rejected under 35 U.S.C. §103(a) as being unpatentable over *Dimitrov* in view of *Weiss* or *Daniels* or *Chee* or *Barbera-Guillem*.

7. Claims 6 and 23 have been rejected under 35 U.S.C. §103(a) as being unpatentable over *Dimitrov/Dimitrov* in view of *Weiss/Weiss* in view of *Dimitrov* or *Vossmeyer/Daniels* in view of *Dimitrov* or *Vossmeyer*, further in view of *Chee/Barbera-Guillem* for the reasons of record as set forth in paragraph 9 of the office action mailed on 2/09/2006 (Office Action, at 11).

8. Claim 7 has been rejected under 35 U.S.C. §103(a) as being unpatentable over *Weiss* in view of *Dimitrov* or *Vossmeyer/Daniels* in view of *Dimitrov* or *Vossmeyer/Chee* in view of *Dimitrov* or *Vossmeyer/Barbera-Guillem* in view of *Dimitrov* or *Vossmeyer*, further in view of *Harris et al.*, United States Patent Application Publication No. 20040009911 ("*Harris*") for the reasons of record as set forth in paragraph 10 of the office action mailed on 2/09/2006 (Office Action, at 11).

9. Claim 9 has been rejected under 35 U.S.C. §103(a) as being unpatentable over *Weiss* in view of *Dimitrov* or *Vossmeyer/Daniels* in view of *Dimitrov* or *Vossmeyer/Chee* in view of *Dimitrov* or *Vossmeyer/Barbera-Guillem* in view of *Dimitrov* or *Vossmeyer*, further in view of *West et al.*, United States Patent No. 6,530,944 ("*West*") for the reasons of record as set forth in paragraph 11 of the Office Action mailed on 2/09/2006 (Office Action, at 11).

10. Claims 12, 13 and 15 have been rejected under 35 U.S.C. §103(a) as being unpatentable over *Weiss* in view of *Dimitrov* or *Vossmeyer/Chee* in view of *Dimitrov* or *Vossmeyer/Barbera-Guillem* in view of *Dimitrov* or *Vossmeyer*, further in view of *Daniels* for

the reasons of record as set forth in paragraph 12 of the Office Action mailed on 2/09/2006 (Office Action, at 11).

11. Claim 13 has been rejected under 35 U.S.C. §103(a) as being unpatentable over *Weiss* in view of *Dimitrov* or *Vossmeyer/Daniels* in view of *Dimitrov* or *Vossmeyer/Chee* in view of *Dimitrov* or *Vossmeyer/Barbera-Guillem* in view of *Dimitrov* or *Vossmeyer*, further in view of *Ravkin et al.*, United States Patent No. 6,908,737 ("*Ravkin*") for the reasons of record as set forth in paragraph 13 of the Office Action mailed on 2/09/2006 (Office Action, at 11).

12. Claim 24 has been rejected under 35 U.S.C. §103(a) as being unpatentable over *Dimitrov/Dimitrov* in view of *Weiss/Weiss* in view of *Dimitrov* or *Vossmeyer/Daniels* in view of *Dimitrov* or *Vossmeyer*, further in view of *Harris* for the reasons of record as set forth in paragraph 14 of the Office Action mailed on 2/09/2006 (Office Action, at 12).

13. Claims 25-29 have been rejected under 35 U.S.C. §103(a) as being unpatentable over *Dimitrov* in view of *Weiss/Weiss* in view of *Dimitrov* or *Vossmeyer*, further in view of *Daniels* for the reasons of record as set forth in paragraph 15 of the Office Action mailed on 2/09/2006 (Office Action, at 12).

14. Claim 28 has been rejected under 35 U.S.C. §103(a) as being unpatentable over *Dimitrov/Dimitrov* in view of *Weiss/Weiss/Daniels* in view of *Ravkin* for the reasons of record as set forth in paragraph 16 of the Office Action mailed on 2/09/2006 for the same reasons as discussed above (Office Action, at 12).

15. Claim 30 has been rejected under 35 U.S.C. §103(a) as being unpatentable over *Dimitrov/Dimitrov* in view of *Weiss/Weiss* in view of *Dimitrov* or *Vossmeyer/Daniels* in view of *Dimitrov* or *Vossmeyer*, further in view of *West* for the reasons of record as set forth in paragraph 17 of the office action mailed on 2/09/2006 (Office Action, at 12).

16. Claim 30 has been rejected under 35 U.S.C. §103(a) as being unpatentable over *Dimitrov/Dimitrov* in view of *Weiss/Weiss* in view of *Dimitrov* or *Vossmeyer/Daniels* in view of *Dimitrov* or *Vossmeyer*, further in view of *Chee* for the reasons of record as set forth in paragraph 18 of the Office Action mailed on 2/09/2006 (Office Action, at 12).

VII. ARGUMENTS

1. Examiner has rejected Claims 1, 3, 5, 8 and 15 under 35 U.S.C. §102(e) as being anticipated by *Dimitrov*, United States Patent Application Publication No. 2003/0013091 ("*Dimitrov*"). Office Action, at 4. Applicant respectfully traverses these rejections.

In making the above-mentioned rejection, the Examiner repeatedly asserts that "in a process of forming a *chemical* adsorbate, *physisorption* of a chemical species onto the surface of nanoparticles is a first necessary step before being *chemically* adsorbed onto the surface of the nanoparticles." Office Action, at 4.

Notwithstanding Applicant's disagreement regarding the term "chemical adsorbate" (see Applicant's arguments traversing the §112 rejections in Applicant's previous response), Applicant once again takes issue with the Examiner's assertion that physisorption is necessarily an intermediate step in the process of chemisorption.

The Examiner states:

> Dimitrov discloses a process comprising: a) exposing a target analyte (claimed chemical species) to a label (See P10, P27, P28, P31, P32) such as CdSe nanoparticles e.g. quantum dots of 1-5 nm (See P38, P39-40) such that the target analyte binds, attaches (adsorbs) to the nanoparticles as a chemical adsorbate (See P10, P12); b) irradiating the nanoparticles comprising the chemical adsorbate with radiation; c) detecting altered photoluminescence properties of the nanoparticles comprising the chemical adsorbate; and d) analyzing the altered photoluminescence properties by comparing to one or more pre-defined altered photoluminescence properties, to provide for an identifying of the chemical species (See P34, P38-40). The analyte can be attached to the label in **solution** or **solid-phase**, including, for example, to a solid surface such as a chip, microarray or bead (See P13). Measurement can be quantitative or qualitative (See P13). Office Action, at 4.

The Examiner is reminded that anticipation requires each and every element of the claim to be found within the cited prior art reference. See, W.L. Gore & Assocs. v. Garlock, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983).

Note that Applicant amended Claim 1 to clarify that the chemical species is *physisorbed* on the nanoparticle (see above).

Firstly, Applicant notes that *Dimitrov* teaches fluorescent labels for nucleic acid strands which can further bind (via hybridization, not adsorption) target nucleic acids. Suitable fluorescent labels can be nanoparticles or quantum dots (*Dimitrov*, para. 38-40). *Dimitrov* teaches that "specifier-label" complexes can be separated from each other by mechanical spreading or flow cytometry, and that such complexes can be detected by a variety of optical and spectroscopic techniques. See *Dimitrov*, para. 100-101. *Dimitrov* does not, however, teach or suggest physisorbing an analyte species directly on a nanoparticle, nor does *Dimitrov* teach or suggest detecting changes in the photoluminescence of the nanoparticle as a result of physisorbing an analyte onto its surface—as required by Claim 1 (Claim 1 requires that the adsorbate induce changes induce changes in the photoluminescence of the nanoparticle). Accordingly, Claim 1 is not anticipated by *Dimitrov*. As Claims 3, 5, 8 and 15 depend directly from Claim 1, having all of the limitations of Claim 1, so too are they not anticipated by *Dimitrov*. See, In re Fine, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988).

Regarding *Dimitrov's* assertion, to which Examiner points, that "[t]he analyte can be attached in solution or solid-phase" (*Dimitrov*, para. 13), it is difficult to understand how a nucleic acid could undergo hybridization in the absence of a solvent. While *Dimitrov* defines "analyte" rather broadly, the only examples given (and the only analytes claimed) are nucleic acids. Besides, their technology relies on hybridization (i.e., binding of one gene digit to its complementary anti-digit), thereby precluding other types of analytes—particularly analytes amenable to gas and solid phase reactions. Accordingly, Claim 1 is further not anticipated by *Dimitrov*. As Claims 3, 5, 8 and 15 depend directly from Claim 1, having all of the limitations of Claim 1, so too are they further not anticipated by *Dimitrov*.

In the final rejection, in support of the Examiner's §102 rejection, of the claims, the Examiner cites a patent to *Hubby Jr. et al.* and a patent to *Ouellet* in support of the Examiner's assertion that physisorption is a first necessary step. Applicant respectfully traverses the Examiner's use of additional references to support a §102 rejection, especially when Applicant has traversed the rejection that the *Dimitrov* reference does not teach all of the limitations. In

a §102 rejection, all of the claim limitations must be taught within the cited prior art reference. It is apparent now that the Examiner is having to resort to additional prior art references to support the Examiner's §102 rejection. This is impermissible. As a result, Applicant respectfully asserts that the Examiner has failed to prove a *prima facie* case of anticipation, and has essentially admitted so by resorting to the additional citations to other patents to support the Examiner's rejection.

Further, the Examiner asserts that claim 1 has the transitional term "comprising", and thus does not exclude unrecited elements. What Applicant believes the Examiner is attempting to assert is that the element not found within the *Dimitrov* reference is inherent in the process disclosed therein. If that is true, Applicant traverses this inherency argument. The MPEP is very clear that in relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art. MPEP 2112. The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. Id.

2. Claims 1-5, 8, 10, 11, 14, 21, 22, 25, 26 and 30 have been rejected under 35 U.S.C. §103(a) as being unpatentable over *Weiss et al.*, United States Patent No. 5,990,479 ("*Weiss*") in view of *Dimitrov* or *Vossmeyer*, United States Patent No. 6,458,327 ("*Vossmeyer*"). Applicant respectfully traverses these rejections.

To establish a *prima facie* case of obviousness under 35 U.S.C. § 103(a), three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure. See M.P.E.P. 706.02(j); see also, *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

The Examiner has applied *Weiss* for the same reasons as set forth in paragraph 4 of the office action mailed on 2/09/06. The Examiner contends that "Weiss et al. further teach that the adherence of a detectable substance to a nanocrystal may comprise **any** sort of bond, including, but not limited to, covalent, ionic, hydrogen bonding, van der Waals forces (claimed physisorption), or mechanical bonding (claimed physisorption) (See column 5, lines 41-46)." Office Action, at 5.

Applicant respectfully points out that, as mentioned in previous responses, *Weiss* teaches a luminescent semiconductor nanocrystal compound comprising: (1) a semiconductor nanocrystal, and (2) a linking agent having a first portion linked to the semiconductor nanocrystal, and a second portion capable of linking to an affinity molecule. Together with the affinity molecule, the luminescent semiconductor compound forms a organo luminescent semiconductor nanocrystal probe capable of bonding to a detectable substance in a material. *Weiss*, col. 2, *ll.* 18-42. This is no different than fluorescent dye labels, except that it has the advantage of being able to label a material with a single type of probe for both electron microscopy and fluorescence. *Weiss*, col. 1, *l.* 23-col. 2, *l.* 2. Furthermore, there is no bonding/binding between the nanocrystal and the detectable substance—it is all done through linker species and affinity molecules. *Weiss* teaches linking agents which covalently bond to glass coatings on the nanoparticles (see *Weiss*, col. 7, *ll.* 54-63; and Table of Linking Agents in col. 8). *Weiss* does not teach a process for detecting chemical species (i.e., analytes) based on their physisorption onto the surface of a nanoparticle and detecting the altered photoluminescence properties of the nanoparticle as a result of such physisorption of the chemical species—as required by Claims 1 and 21.

The Examiner further argues that while "Weiss et al do not expressly teach that an exposure of the detectable substance to the nanocrystal is carried out in a solid or gas phase (Claims 1, 21)," that "Dimitrov teaches that an analyte (a detectable substance) can be attached to a nanoparticle, e.g. quantum dot, in a **solution** or **solid-phase**, including, for example, to a solid surface such as a chip, microarray or bead (See P13)," and that "[i]t would have been obvious to one of ordinary skill in the art at the time the invention was made to have carried out an exposure of a detectable substance to a nanocrystal in Weiss et al in solid phase since Weiss et al do not

limit the exposure to a particular phase and Dimitrov teaches that an analyte (a detectable substance) can be attached to a nanoparticle in a solution or solid-phase." Office Action, at 5.

As mentioned above, *Dimitrov* does not teach any analyte that doesn't involve hybridization, such hybridization requires a liquid phase, and such hybridization is not adsorption (adsorption requires a surface). Further, the analyte does not induce changes in the photoluminescence of the nanoparticle. Claims 1 and 21 require that a chemical species physisorb onto the surface of a nanoparticle and induce a change in the photoluminescence of the nanoparticle. No combination of *Weiss* and *Dimitrov* teaches or suggest all of the limitations of Claims 1 and 21, particularly that the chemical species physisorb onto a surface of the nanoparticle and detect altered photoluminescence properties as a result of said physisorption. Accordingly, Claims 1 and 21 (and Claims depending therefrom) are not obvious in view of the combination of *Weiss* and *Dimitrov*.

The Examiner further argues that since "Vossmeyer teaches that adsorption of an analyte (a detectable substance) to a nanoparticle of 20 nm or less (See column 3, lines 36-40) may be carried out in a **liquid** or **gas-phase** (See Abstract; column 5, lines 34-45)," that "[i]t would have been obvious to one of ordinary skill in the art at the time the invention was made to have carried out an exposure of a detectable substance to a nanocrystal in Weiss et al in a gas phase since Weiss et al do not limit the exposure to a particular phase and Vossmeyer teaches that adsorption of an analyte (a detectable substance) to a nanoparticle of 20 nm or less (See column 3, lines 36-40) may be carried out in a liquid or gas-phase." Office Action, at 5.

Applicant respectfully points out that *Vossmeyer* teaches an electronic sensor (see title), not one based on photoluminescence. While *Vossmeyer* may permit the sensing of species based on their adsorption, it does so via a completely different mechanism than that of the present invention. Combining *Weiss* with *Vossmeyer* still fails to teach or suggest all of the limitations required by Claims 1 and 21, and all Claims depending therefrom, because neither teach or suggest (they are quite unrelated) a process for detecting chemical species (i.e., analytes) based on their physisorption onto the surface of a nanoparticle and detecting the altered photoluminescence properties of the nanoparticle as a result of such physisorption of the chemical species—as required by Claims 1 and 21. Accordingly, Claims 1 and 21, and all

claims depending therefrom, are not obvious in view of the combination of *Weiss* and *Vossmeyer*.

3. Claims 1-5, 8, 12, 15, 21, 22, 27, 29 and 30 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Daniels et al.*, United States Patent Application Publication No. 20020004246 ("*Daniels*") in view of *Dimitrov* or *Vossmeyer*. Applicant respectfully traverses these rejections.

The Examiner has applied *Daniels* here for the same reasons as set forth in paragraph 5 of the office action mailed on 2/09/2006. The Examiner contends that "Daniels et al teach that binding of a detectable substance to a nanocrystal is *typically* non-covalent (i.e. could be covalent or non-covalent) (See P88)," and that "Daniels et al further teach that exposure can be carried out in a **liquid** media (See P259)." While "Daniels et al do not expressly teach that an exposure of the detectable substance to the nanocrystal is carried out in a solid or gas phase (Claims 1, 21)," the Examiner contends that "Dimitrov teaches that an analyte (a detectable substance) can be attached to a nanoparticle, e.g. quantum dot, in a **solution** or **solid-phase**, including, for example, to a solid surface such as a chip, microarray or bead (See P13)," and that "[i]t would have been obvious to one of ordinary skill in the art at the time the invention was made to have carried out an exposure of a detectable substance to a nanocrystal in Daniels et al in a solid phase since Daniels et al do not limit the exposure to a particular phase and Dimitrov teaches that an analyte (a detectable substance) can be attached to a nanoparticle in a solution or solid-phase." Office Action, at 6-7.

As mentioned in the Applicant's previous responses, *Daniels* teaches an immunochromatographic test strip assay which utilizes quantum dots as detectable labels. Like *Dimitrov* and *Weiss* above, *Daniels* requires a targeting compound bound to the nanocrystals, wherein the targeting compound "has affinity for one or more selected biological or chemical targets." *Daniels*, para. 16. Thus, the analyte is not in direct contact (via surface physisorption) with the nanocrystals (and hence, not physisorbed), and no change in the luminescent properties of the nanocrystal are either induced or monitored—as required by Claims 1 and 21 of the

present Application. Additionally, *Daniels* does not teach or suggest gas and/or solid phase exposure.

Regarding the Examiner's contention that *Daniels* teaches non-covalent attachment of a detectable substance to a nanocrystal (*Daniels*, para. 88), Applicant respectfully points out that this passage refers to the binding between members of the binding pair, e.g., biotin-streptavidin, complementary nucleic acid pairs, etc., as listed in *Daniels*, para. 89, and not the binding to the nanocrystal surface. Production of "nanocrystal conjugates" involving a member of the binding pair attached (covalently) to the nanocrystal by way of a linker species is described in *Daniels*, para. 178-187.

Claims 1 and 21 require that a chemical species physisorb onto the surface of a nanoparticle and induce a change in the photoluminescence of the nanoparticle. The deficiencies of *Dimitrov* are discussed above. No combination of *Daniels* and *Dimitrov* teaches or suggest all of the limitations of Claims 1 and 21. Accordingly, Claims 1 and 21 (and Claims depending therefrom) are not obvious in view of the combination of *Daniels* and *Dimitrov*.

The Examiner further contends that "Vossmeyer teaches that adsorption of an analyte (a detectable substance) to a nanoparticle of 20 nm or less (See column 3, lines 36-40) may be carried out in a **liquid** or **gas-phase** (See Abstract; column 5, lines 34-45)," and that "[i]t would have been obvious to one of ordinary skill in the art at the time the invention was made to have carried out an exposure of a detectable substance to a nanocrystal in Daniels et al in a gas phase since Weiss et al do not limit the exposure to a particular phase and Vossmeyer teaches that adsorption of an analyte (a detectable substance) to a nanoparticle of 20 nm or less (See column 3, lines 36-40) may be carried out in a liquid or gas-phase." Office Action, at 7.

Combining *Vossmeyer* with *Daniels* still fails to teach or suggest all of the limitations of Claims 1 and 21, and all Claims depending therefrom. The deficiencies of *Daniels* and *Vossmeyer* are both described above. Moreover, because of the differences in the art involved, there is no motivation to combine these references—even if they did collectively teach all of the limitations of Claims 1 and 21. Accordingly, Claims 1 and 21 (and Claims depending therefrom) are not obvious in view of the combination of *Daniels* and *Vossmeyer*.

4. Claims 1-3, 5, 6, 8, 10, 11 and 14 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Chee et al.*, United States Patent No. 6,544,732 ("*Chee*") in view of *Dimitrov* or *Vossmeyer*. Applicant respectfully traverses these rejections.

The Examiner has applied *Chee* here for the same reasons as set forth in paragraph 6 of the office action mailed on 2/09/2006. The Examiner contends that "Chee et al further teach that exposure can be carried out in a **liquid** media (See column 25, lines 36-38)," but that "Chee et al do not expressly teach that an exposure of the detectable substance to the nanocrystal is carried out in a solid or gas phase (Claims 1, 21)." The Examiner further contends that as "Dimitrov teaches that an analyte (a detectable substance) can be attached to a nanoparticle, e.g. quantum dot, in a **solution** or **solid-phase**, including, for example, to a solid surface such as a chip, microarray or bead (See P13)," that "[i]t would have been obvious to one of ordinary skill in the art at the time the invention was made to have carried out an exposure of a detectable substance to a nanocrystal in Chee et al in a solid phase since Chee et al do not limit the exposure to a particular phase and Dimitrov teaches that an analyte (a detectable substance) can be attached to a nanoparticle in a solution or solid-phase." Office Action, at 7-8.

Applicant respectfully points out that *Chee* teaches a biological assay comprising beads or microspheres to which chemical functionality (i.e., bioactive agents) is imparted. Nanocrystals can be incorporated into the beads in lieu of fluorescent dyes so as to provide for a unique optical signature for that particular bead. *Chee*, col. 3, *ll.* 41-56. As in the case of *Dimitrov*, *Weiss* and *Daniels*, *Chee* utilizes nanocrystals merely as fluorescent labels. Such nanocrystals (nanoparticles) do not interact directly with the biological molecules (analyte) being assayed by having the analyte physisorb onto the surface of the nanocrystal under a gas and/or solid phase exposure—as required by Claim 1 of the present Application. Even when combined with *Dimitrov*, all of the limitations of Claim 1 are neither taught nor suggested. Accordingly, Claim 1, and all claims depending directly or indirectly therefrom, are not obvious in view of *Chee* in combination with *Dimitrov*.

The Examiner further contends that "Vossmeyer teaches that adsorption of an analyte (a detectable substance) to a nanoparticle of 20 nm or less (See column 3, lines 36-40) may be carried out in a **liquid** or **gas-phase** (See Abstract; column 5, lines 34-45)," and that "[i]t would

have been obvious to one of ordinary skill in the art at the time the invention was made to have carried out an exposure of a detectable substance to a nanocrystal in Chee et al in a gas phase since Chee et al do not limit the exposure to a particular phase and Vossmeyer teaches that adsorption of an analyte (a detectable substance) to a nanoparticle of 20 nm or less (See column 3, lines 36-40) may be carried out in a liquid or gas-phase." Office Action, at 8.

Carrying out the nanoparticle/analyte exposure in a gas or solid phase is not the only deficiency of *Chee* (see above). Furthermore, there is no motivation for combining *Chee* with *Vossmeyer*. *Vossmeyer* is quite different subject matter (see above), and the inappropriate combination of *Chee* and *Vossmeyer* still fails to teach or suggest all of the limitations of Claim 1, and all Claims depending therefrom. Besides, carrying out the method of *Chee* in a solid and/or gas phase would preclude analysis (via fluorescent labeling) of biological molecules, and the Examiner is reminded that the proposed modification cannot change the principle of operation of the prior art being modified, nor can the proposed modification render the prior art unsatisfactory for its intended purpose. *See* M.P.E.P. 2143.01, *see* also *In re Ratti*, 270 F.2d 810, 123 U.S.P.Q. 349 (CCPA 1959) and *In re Gordon*, 733 F.2d 900, 221 U.S.P.Q. 1125 (Fed. Cir. 1984), respectively. Accordingly, Claim 1, and all Claims depending therefrom, are not obvious in view of the combination of *Chee* and *Vossmeyer*.

5. Claims 1-3, 5, 6, 8, 10, 11, 14 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Barbera-Guillem et al.*, United States Patent No. 6,261,779 ("*Barbera-Guillem*") in view of *Dimitrov* or *Vossmeyer*. Applicant respectfully traverses these rejections.

The Examiner has stated that "Barbera-Guillem et al are applied here for the same reasons as set forth in paragraph 6 of the Office Action mailed on 2/09/2006." The Examiner contends that "Barbera-Guillem et al do not expressly teach that an exposure of the detectable substance to the nanocrystal is carried out in a solid or gas phase (Claims 1, 21)," but that "Dimitrov teaches that an analyte (a detectable substance) can be attached to a nanoparticle, e.g. quantum dot, in a **solution** or **solid-phase**, including, for example, to a solid surface such as a chip, microarray or bead (See P13)," and that "[i]t would have been obvious to one of ordinary skill in the art at the time the invention was made to have carried out an exposure of a detectable

substance to a nanocrystal in Barbera-Guillem et al in a solid phase since Barbera-Guillem et al do not limit the exposure to a particular phase and Dimitrov teaches that an analyte (a detectable substance) can be attached to a nanoparticle, e.g. quantum dot, in a solution or solid-phase." Office Action, at 8-9.

Applicant respectfully points out that *Barbera-Guillem* teaches an amplifiable non-isotopic detection system for biological molecules that comprises "nanocrystals that are functionalized to be water-soluble, and further functionalized to comprise a plurality of polynucleotide strands of known sequence which extend outwardly from each nanocrystal." *Barbera-Guillem*, col. 2, *ll.* 13-19. As in the cases of *Dimitrov*, *Weiss*, *Daniels* and *Chee* above, *Barbera-Guillem* utilizes nanocrystals as fluorescent labels. Such nanocrystals (nanoparticles) do not interact directly with the biological molecules (analyte) being assayed by having the analyte physisorb onto the surface of the nanoparticles under a gas and/or solid phase exposure—as required by Claim 1 of the present Application. Further combination of *Barbera-Guillem* with *Dimitrov* (deficiencies of the latter are described above) still fails to teach or suggest all of the limitations of Claim 1. Accordingly, Claim 1, and all Claims depending therefrom, are not obvious in view of the combination of *Barbera-Guillem* and *Dimitrov*.

The Examiner further contends that "Vossmeyer teaches that adsorption of an analyte (a detectable substance) to a nanoparticle of 20 nm or less (See column 3, lines 36-40) may be carried out in a **liquid** or **gas-phase** (See Abstract; column 5, lines 34-45)," and that "[i]t would have been obvious to one of ordinary skill in the art at the time the invention was made to have carried out an exposure of a detectable substance to a nanocrystal in Barbera-Guillem et al in a gas phase since Barbera-Guillem et al do not limit the exposure to a particular phase and Vossmeyer teaches that adsorption of an analyte (a detectable substance) to a nanoparticle of 20 nm or less (See column 3, lines 36-40) may be carried out in a liquid or gas-phase."

As mentioned above, *Vossmeyer* involves an electronic sensing mechanism, and the combination with *Barbera-Guillem*, which involves biological molecules, is substantially contrived. Nevertheless, such combination still fails to teach or suggest all of the limitations of Claim 1, particularly wherein the altered photoluminescence properties of the nanoparticles are the result of the chemical species being physisorbed. Accordingly, Claim 1, and all Claims

depending therefrom, are not obvious in view of the combination of *Barbera-Guillem* and *Vossmeyer*.

6. Claims 2, 21, 25, 26, and 29 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Dimitrov* in view of *Weiss* or *Daniels* or *Chee* or *Barbera-Guillem*. Applicant respectfully traverses these rejections.

The Examiner states that "Dimitrov are applied here for the same reasons as above," and notes that "Dimitrov fails to teach that radiation comprises UV (Claims 2, 21); detecting and analyzing an altered photoluminescence properties comprises utilizing a wavelength selective detector (Claims 25 and 26)." Office Action, at 9.

The Examiner further states:

> As to claims 2 and 21, Weiss et al/Daniels et al/Chee et al/Barbera-Guillem et al teach that UV can be used for as a radiation source for nanocrystals (See above).
>
> It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used UV as a radiation source for nanocrystals in Dimitrov Weiss et al/Daniels et al/Chee et al/Barbera-Guillem et al teach that UV can be used for as a radiation source for nanocrystals. Office Action, at 9.

Claim 2 depends directly from Claim 1 and is not unpatentable for the same reasons Claim 1 is not patentable (see *In re Fine*, cited earlier). Similarly, the deficiencies of the art the Examiner has cited have been addressed in earlier sections of this paper. Irrespective of the type of radiation used, no combination of *Dimitrov* in view of *Weiss* or *Daniels* or *Chee* or *Barbera-Guillem* teaches or suggests all of the limitations of Claim 21, particularly wherein the altered photoluminescence properties of the nanoparticles are the result of the chemical species being physisorbed. Accordingly, Claims 2 and 21 are not obvious in view of *Dimitrov* combined with *Weiss* or *Daniels* or *Chee* or *Barbera-Guillem*.

The Examiner further states:

> As to claims 25 and 26, Weiss et al teach that the organo luminescent semiconductor is capable of exhibiting a detectable change in adsorption (See column 2, lines 24-25), i.e.

the organo luminescent semiconductor of Weiss is capable of detecting altered photoluminescence properties of the nanoparticles comprising the chemical adsorbate as a result of the chemical species being adsorbed onto the surface of the nanoparticles. The presence of the detectable substance in the material is then determined either by **measuring** the absorption of energy by the organo luminescent semiconductor nanocrystal probe and/or detecting the emission of radiation of a narrow wavelength band by the organo luminescent semiconductor nanocrystal probe and/or detecting the scattering or diffraction by the organo luminescent semiconductor nanocrystal probe, indicative (in either case) of the presence of the organo luminescent semiconductor nanocrystal probe bonded to the detectable substance in the material (See column 3, lines 19-29) obviously utilizing a wavelength selective detector. Office Action, at 10.

Claims 25 and 26 both depend directly from Claim 21 and are not obvious in view of *Dimitrov* combined with *Weiss* or *Daniels* or *Chee* or *Barbera-Guillem* for the same reasons Claim 21 is not obvious (see *In re Fine*, cited earlier).

7. Claims 4 and 22 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over *Dimitrov* in view of *Weiss*. Applicant respectfully traverses these rejections.

The Examiner states that *Dimitrov* is applied here for the same reasons as above. The Examiner contends that while "Dimitrov fails to teach that silicon nanoparticles are used instead of CdSe nanoparticles," that "Weiss et al teach that either CdSe nanoparticles or silicon nanoparticles can be used for detecting an analyte (See column 5, lines 65; column 6, line 2)," and that "[i]t would have been obvious to one of ordinary skill in the art at the time the invention was made to have used silicon nanoparticles in Dimitrov instead of CdSe nanoparticles since Weiss et al teach that either CdSe nanoparticles or silicon nanoparticles can be used for detecting an analyte." Office Action, at 10.

The deficiencies of *Dimitrov* and *Weiss* are described above. Claims 4 and 22 depend from Claims 1 and 21, respectively, and are not obvious for the same reasons (*In re Fine*). Nothwithstanding the foregoing, given that both *Dimitrov* and *Weiss* rely on covalent binding of analyte species to the nanoparticles (they employ them as labels), the surface chemistry involved,

generally involving a linker species, is highly dependent upon the composition of the nanoparticle. Hence, substitution of Si for CdSe is not obvious, as the Examiner suggests, because doing so would likely entail undue experimentation to generate proper covalent surface binding. Accordingly, Claims 4 and 22 are not obvious in view of the combination of *Dimitrov* and *Weiss*—which neither teaches nor suggests the limitations of these Claims.

8. The Examiner has rejected Claims 6 and 23 under 35 U.S.C. § 103(a) as being unpatentable over *Dimitrov/Dimitrov* in view of *Weiss/Weiss* in view of *Dimitrov* or *Vossmeyer/Daniels* in view of *Dimitrov* or *Vossmeyer*, further in view of *Chee/Barbera-Guillem* for the reasons of record as set forth in paragraph 9 of the office action mailed on 2/09/2006 (Office Action, at 11). Applicant respectfully traverses these rejections.

Applicant respectfully points out that Claim 6 merely introduces an additional limitation, in terms of the kinds of chemical species being investigated, to Claim 1. Since Claim 6 depends directly from Claim 1, and as Claim 1 is neither anticipated by, nor obvious in view of any combination of *Dimitrov*, *Weiss*, *Vossmeyer*, *Daniels*, *Chee* and *Barbera-Guillem* (see above), neither is Claim 6 anticipated by, nor obvious in view of any combination of *Dimitrov*, *Weiss*, *Vossmeyer*, *Daniels*, *Chee* and *Barbera-Guillem*. Likewise, Claim 23 merely introduces an analogous additional limitation, in terms of the kinds of chemical species being investigated, to Claim 21. Since Claim 23 depends directly from Claim 21, and as Claim 21 is neither anticipated by, nor obvious in view of any combination of *Dimitrov*, *Weiss*, *Vossmeyer*, *Daniels*, *Chee* and *Barbera-Guillem* (see above), neither is Claim 23 anticipated by, nor obvious in view of any combination of *Dimitrov*, *Weiss*, *Vossmeyer*, *Daniels*, *Chee* and *Barbera-Guillem*.

9. The Examiner has rejected Claim 7 under 35 U.S.C. § 103(a) as being unpatentable over *Weiss* in view of *Dimitrov* or *Vossmeyer/Daniels* in view of *Dimitrov* or *Vossmeyer/Chee* in view of *Dimitrov* or *Vossmeyer/Barbera-Guillem* in view of *Dimitrov* or *Vossmeyer*, further in view of Harris et al., United States Patent Application Publication No. 20040009911 ("*Harris*") for the reasons of record as set forth in paragraph 10 of the office action mailed on 2/09/2006 (Office Action, at 11). Applicant respectfully traverses this rejection.

Regarding *Harris*, of paragraphs 8, 16, 156, and 161 in *Harris* to which Examiner points, only paragraphs 16 and 161 appear to discuss quantum dots. Furthermore, Applicant is unclear as to which processes of *Harris* are deemed reversible by the Examiner. Regardless, as Claim 1 (from which Claim 7 directly depends) is neither anticipated by, nor obvious in view of, any combination of *Dimitrov*, *Vossmeyer*, *Daniels*, *Chee*, *Barbera-Guillem*, and *Harris*, neither is Claim 7 anticipated by, nor obvious in view of, any combination of *Dimitrov*, *Vossmeyer*, *Daniels*, *Chee*, *Barbera-Guillem* and *Harris*.

10. The Examiner has rejected Claim 9 under 35 U.S.C. § 103(a) as being unpatentable over *Weiss* in view of *Dimitrov* or *Vossmeyer/Daniels* in view of *Dimitrov* or *Vossmeyer/Chee* in view of *Dimitrov* or *Vossmeyer/Barbera-Guillem* in view of *Dimitrov* or *Vossmeyer*, further in view of West et al., United States Patent No. 6,530,944 ("*West*") for the reasons of record as set forth in paragraph 11 of the Office Action mailed on 2/09/2006 (Office Action, at 11). Applicant respectfully traverses this rejection.

The passage in *West* to which Examiner points (*West*, col. 16, *ll.* 5-8) regards delivery of nanoparticles to a human patient as a diagnostic tool (i.e., imaging agent), or as part of a therapeutic treatment, wherein such delivery is provided by a nasal spray. Considering the dissimilar nature of the arts involved, it would not have been obvious to combine (there is no suggestion or motivation for doing so) the teachings of *West* with any of *Weiss*, *Dimitrov*, *Vossmeyer*, *Daniels*, *Chee*, and/or *Barbera-Guillem*. Regardless, as Claim 1 (from which Claim 9 directly depends) is neither anticipated by, nor obvious in view of any combination of *Weiss*, *Dimitrov*, *Vossmeyer*, *Daniels*, *Chee*, and/or *Barbera-Guillem* and *West*, neither is Claim 9 anticipated by, nor obvious in view of any combination of *Weiss*, *Dimitrov*, *Vossmeyer*, *Daniels*, *Chee*, and/or *Barbera-Guillem* and *West*.

11. The Examiner has rejected Claims 12, 13 and 15 under 35 U.S.C. § 103(a) as being unpatentable over *Weiss* in view of *Dimitrov* or *Vossmeyer/Chee* in view of *Dimitrov* or *Vossmeyer/Barbera-Guillem* in view of *Dimitrov* or *Vossmeyer*, further in view of *Daniels* for the reasons of record as set forth in paragraph 12 of the Office Action mailed on 2/09/2006 (Office Action, at 11). Applicant respectfully traverses these rejections.

As mentioned above, none of *Weiss*, *Dimitrov*, *Vossmeyer*, *Daniels*, *Chee* and *Barbera-Guillem*, either alone or in combination, provide for or suggest the process of Claim 1. As Claims 12, 13, and 15 all depend directly from Claim 1, for the same reasons, they too are not anticipated by, or obvious in view of, any combination of *Weiss*, *Dimitrov*, *Vossmeyer*, *Daniels*, *Chee* and *Barbera-Guillem*.

12. The Examiner has rejected Claim 13 under 35 U.S.C. § 103(a) as being unpatentable over *Weiss* in view of *Dimitrov* or *Vossmeyer/Daniels* in view of *Dimitrov* or *Vossmeyer/Chee* in view of *Dimitrov* or *Vossmeyer/Barbera-Guillem* in view of *Dimitrov* or *Vossmeyer*, further in view of Ravkin et al., United States Patent No. 6,908,737 ("*Ravkin*") for the reasons of record as set forth in paragraph 13 of the Office Action mailed on 2/09/2006 (Office Action, at 11). Applicant respectfully traverses this rejection.

Like *Weiss*, *Dimitrov*, *Vossmeyer*, *Daniels*, *Chee* and *Barbera-Guillem*, *Ravkin* also teaches the use of nanocrystals as fluorescent labels, wherein such fluorescent labels are disposed on or otherwise associated with coded carriers used in the detection and quantification of generally biological analytes, wherein the carriers generally comprise biological probe molecules. See *Ravkin*, Abstract and col. 14, *ll.* 38-60. None of *Weiss*, *Dimitrov*, *Vossmeyer*, *Daniels*, *Chee*, *Barbera-Guillem*, and *Ravkin* teach or suggest a process of detecting chemical species by their physisorption onto a nanoparticle surface under a gas and/or solid phase exposure and subsequently evaluating the altered photoluminescence of the nanoparticle as a result of such physisorption—as required by Claim 1. As Claim 13 depends directly from Claim 1, it is not anticipated by, or obvious in view of, any combination of *Weiss*, *Dimitrov*, *Vossmeyer*, *Daniels*, *Chee*, *Barbera-Guillem* and *Ravkin* for the same reasons Claim 1 is not anticipated by, or obvious in view of, any combination of *Weiss*, *Dimitrov*, *Vossmeyer*, *Daniels*, *Chee*, *Barbera-Guillem*, *Ravkin*.

13. The Examiner has rejected Claim 24 under 35 U.S.C. § 103(a) as being unpatentable over *Dimitrov/Dimitrov* in view of *Weiss/Weiss* in view of *Dimitrov* or *Vossmeyer/Daniels* in view of *Dimitrov* or *Vossmeyer*, further in view of *Harris* for the reasons of record as set forth in

paragraph 14 of the Office Action mailed on 2/09/2006 (Office Action, at 12). Applicant respectfully traverses this rejection.

As mentioned above, of paragraphs 8, 16, 156, and 161 in *Harris* to which Examiner points, only paragraphs 16 and 161 appear to discuss quantum dots. Furthermore, Applicant remains unclear as to which processes of *Harris* are deemed reversible by the Examiner. Regardless, as Claim 21 (from which Claim 24 directly depends) is neither anticipated by, nor obvious in view of, any combination of *Weiss*, *Dimitrov*, *Vossmeyer*, *Daniels*, and *Harris*, neither is Claim 24 anticipated by, nor obvious in view of, any combination of *Weiss*, *Daniels*, and *Harris*.

14. The Examiner has rejected Claims 25-29 under 35 U.S.C. § 103(a) as being unpatentable over *Dimitrov* in view of *Weiss/Weiss* in view of *Dimitrov* or *Vossmeyer*, further in view of *Daniels* for the reasons of record as set forth in paragraph 15 of the Office Action mailed on 2/09/2006 (Office Action, at 12). Applicant respectfully traverses this rejection.

Claims 25-29 depend directly from Claim 21. As Claim 21 is neither anticipated by, nor obvious in view of, any combination of *Dimitrov*, *Weiss*, *Vossmeyer* and *Daniels*, neither are Claims 25-29 anticipated by, nor obvious in view of, any combination of *Dimitrov*, *Weiss*, *Vossmeyer* and *Daniels*.

15. The Examiner has rejected Claim 28 under 35 U.S.C. § 103(a) as being unpatentable over *Dimitrov/Dimitrov* in view of *Weiss/Weiss/Daniels* in view of *Ravkin* for the reasons of record as set forth in paragraph 16 of the Office Action mailed on 2/09/2006 for the same reasons as discussed above (Office Action, at 12). Applicant respectfully traverses this rejection.

As mentioned above, *Ravkin* teaches the use of nanocrystals as fluorescent labels, wherein such fluorescent labels are disposed on or otherwise associated with coded carriers used in the detection and quantification of generally biological analytes, wherein the carriers generally comprise biological probe molecules. See *Ravkin*, Abstract and col. 14, *ll.* 38-60. None of *Dimitrov*, *Weiss*, *Daniels*, and *Ravkin* teach or suggest a process of detecting chemical species by their physisorption onto a nanoparticle surface under a gas and/or solid phase exposure and

subsequently evaluating the altered photoluminescence of the nanoparticle as a result of such physisorption—as required by Claim 21. As Claim 28 depends directly from Claim 21, it is not anticipated by, or obvious in view of, any combination of *Dimitrov*, *Weiss*, *Daniels*, and *Ravkin* for the same reasons Claim 21 is not anticipated by, or obvious in view of, any combination of *Dimitrov*, *Weiss*, *Daniels*, and *Ravkin*.

16. The Examiner has rejected Claim 30 under 35 U.S.C. § 103(a) as being unpatentable over *Dimitrov/Dimitrov* in view of *Weiss/Weiss* in view of *Dimitrov* or *Vossmeyer/Daniels* in view of *Dimitrov* or *Vossmeyer*, further in view of *West* for the reasons of record as set forth in paragraph 17 of the office action mailed on 2/09/2006 (Office Action, at 12). Applicant respectfully traverses this rejection.

As mentioned above, the passage in *West* to which Examiner points (*West*, col. 16, *ll.* 5-8) regarding an aerosol actually involves delivery of nanoparticles to a human patient as a diagnostic tool (i.e., imaging agent), or as part of a therapeutic treatment, wherein such delivery is provided by a nasal spray. Considering the dissimilar nature of the arts involved, it would not have been obvious to combine the teachings of *West* with any of *Dimitrov*, *Weiss*, *Vossmeyer* and/or *Daniels*. Regardless, as Claim 21 (from which Claim 30 directly depends) is neither anticipated by, nor obvious in view of any combination of *Dimitrov*, *Weiss*, *Vossmeyer*, *Daniels* and *West*, neither is Claim 30 anticipated by, nor obvious in view of any combination of *Dimitrov*, *Weiss*, *Vossmeyer*, *Daniels* and *West*.

17. The Examiner has rejected Claim 30 under 35 U.S.C. § 103(a) as being unpatentable over *Dimitrov/Dimitrov* in view of *Weiss/Weiss* in view of *Dimitrov* or *Vossmeyer/Daniels* in view of *Dimitrov* or *Vossmeyer*, further in view of *Chee* for the reasons of record as set forth in paragraph 18 of the Office Action mailed on 2/09/2006 (Office Action, at 12). Applicant respectfully traverses this rejection.

Applicant respectfully points out that the passages to which the Examiner points in *Chee* (col. 1, *ll.* 10-13, and 25-30; and col. 2, *ll.* 59-64), refer to prior art methods and not to the invention of *Chee*. *Chee* does not teach using nanoparticle-based sensors and assays for

detecting analyte gases, nor does *Chee* suggest how such sensors and assays might be used for detecting such analyte gases. Regardless, as Claim 21 (from which Claim 30 directly depends) is neither anticipated by, nor obvious in view of any combination of *Dimitrov*, *Weiss*, *Vossmeyer*, *Daniels* and *Chee*, neither is Claim 30 anticipated by, nor obvious in view of any combination of *Dimitrov*, *Weiss*, *Vossmeyer*, *Daniels* and *Chee*.

Please apply $250 for the brief fee and $60 for the required fee for the Petition for Extension of Time and any other necessary charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

Date: February 27, 2007

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CLAIMS APPENDIX

1. A process comprising:

a) exposing a chemical species to nanoparticles such that said chemical species physisorbs onto a surface of the nanoparticles as an adsorbate, wherein such exposing is carried out as an exposure selected from the group consisting of a gas phase exposure, a solid phase exposure, and combinations thereof;

b) irradiating the nanoparticles comprising the adsorbate with radiation;

c) detecting altered photoluminescence properties of the nanoparticles comprising the adsorbate as a result of the chemical species being physisorbed onto the surface of the nanoparticles; and

d) analyzing the altered photoluminescence properties by comparing to one or more pre-defined altered photoluminescence properties, to provide for an identifying of the chemical species.

2. The process of claim 1, wherein the radiation comprises ultraviolet radiation.

3. The process of claim 1, wherein the nanoparticles comprise quantum confined nanoparticles.

4. The process of claim 1, wherein the nanoparticles comprise silicon nanoparticles.

5. The process of claim 1, wherein the one or more pre-defined altered photoluminescence properties are provided by exposing nanoparticles having initial photoluminescence properties to one or more known chemical species.

6. The process of claim 1, wherein the chemical species is selected from the group consisting of toxins, carcinogens, mutagens, lachrymators, flammable species, nerve agents, explosives, and combinations thereof.

7. The process of claim 1, wherein the adsorption of a chemical species onto the surface of the nanoparticles comprises a reversible process.

8. The process of claim 1, wherein the nanoparticles range in size from about 1 nm to about 100 nm.

9. The process of claim 1, wherein the nanoparticles are present in an aerosol.

10. The process of claim 1, wherein the detecting the altered photoluminescence properties comprises utilizing a wavelength selective detector.

11. The process of claim 1, wherein the analyzing the altered photoluminescence properties comprises utilizing a wavelength selective detector.

12. The process of claim 1, wherein the detecting and analyzing the altered photoluminescence properties comprises utilizing a spectrometer.

13. The process of claim 1, wherein the detecting and analyzing the altered photoluminescence properties comprises utilizing an optical filter.

14. The process of claim 1, wherein the nanoparticles are silicon nanocrystals.

15. The process of claim 1, further comprising determining a concentration of the chemical species.

21. A process comprising:

a) exposing a chemical species to quantum-confined silicon nanoparticles such that said chemical species physisorbs onto a surface of the quantum-confined silicon nanoparticles as an adsorbate, wherein such exposing is carried out as an exposure selected from the group consisting of a gas phase exposure, a solid phase exposure, and combinations thereof;

b) irradiating the quantum-confined silicon nanoparticles comprising the adsorbate with ultraviolet radiation;

c) detecting altered photoluminescence properties of the quantum-confined silicon nanoparticles comprising the adsorbate as a result of the chemical species being physisorbed onto the surface of the quantum-confined silicon nanoparticles; and

d) analyzing the altered photoluminescence properties by comparing to one or more pre-defined altered photoluminescence properties, to provide for an identifying of the chemical species.

22. The process of claim 21, wherein the one or more pre-defined altered photoluminescence properties are provided by exposing quantum-confined silicon nanoparticles having initial photoluminescence properties to one or more known chemical species.

23. The process of claim 21, wherein the chemical species is selected from the group consisting of toxins, carcinogens, mutagens, lachrymators, flammable species, nerve agents, explosives, and combinations thereof.

24. The process of claim 21, wherein the adsorption of a chemical species onto a surface of the quantum-confined silicon nanoparticles comprises a reversible process.

25. The process of claim 21, wherein the detecting the altered photoluminescence properties comprises utilizing a wavelength selective detector.

26. The process of claim 21, wherein the analyzing the altered photoluminescence properties comprises utilizing a wavelength selective detector.

27. The process of claim 21, wherein the detecting and analyzing the altered photoluminescence properties comprises utilizing a spectrometer.

28. The process of claim 21, wherein the detecting and analyzing the altered photoluminescence properties comprises utilizing an optical filter.

29. The process of claim 21, further comprising determining a concentration of the chemical species.

30. The process of claim 21, wherein the step of exposing is carried out in the gas phase.

EVIDENCE APPENDIX

No evidence was submitted pursuant to §§1.130, 1.131, or 1.132 of 37 C.F.R. or of any other evidence entered by the Examiner and relied upon by Appellants in the Appeal.

RELATED PROCEEDINGS APPENDIX

None.